TEST CONDITIONS AND EQUIPMENT FOR DETERMINING THE ENERGY STAR® QUALIFICATION STATUS OF IMAGING EQUIPMENT PRODUCTS

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The following test conditions shall be applied to the Operational Mode (OM) and Typical Electricity Consumption (TEC) imaging equipment test procedures of the ENERGY STAR Office Equipment Program. These cover copiers, digital duplicators, fax machines, mailing machines, multifunction devices, printers, and scanners.

Below are the ambient test conditions that must be established when performing the energy or power measurements. These are necessary in order to ensure that outside factors do not affect the test results, and that test results are reproducible. Specifications for test equipment follow the test conditions.

I. TEST CONDITIONS

General Criteria

Supply Voltage*:	North America/Taiwan:	115 (± 1%) Volts AC, 60 Hz (± 1%)
	Europe/Australia/New Zealand:	230 (± 1%) Volts AC, 50 Hz (± 1%)
	Japan:	100 (± 1%) Volts AC, 50 Hz (± 1%)/60 Hz (± 1%)
		Note: In all cases, for products rated to consume more than 1.5 kW, the voltage range is ± 4%
Total Harmonic Distortion (Voltage):	< 2% THD (< 5% for products which are rated for > 1.5 kW maximum power)	
Ambient Temperature:	23°C ± 5°C	
Relative Humidity:	10 – 80 %	

(Reference IEC 62301: Household Electrical Appliances – Measurement of Standby Power, Sections 3.2, 3.3)

***Supply Voltage**: Manufacturers shall test their products based on the market in which the partner intends to sell the products as ENERGY STAR qualified. For equipment that is sold in multiple international markets and therefore rated at multiple input voltages, the manufacturer must test at and report all relevant voltages and power consumption levels. For example, a manufacturer that is shipping the same printer model to the United States and Europe must measure and report the TEC or OM values at both 115 Volts/60 Hz and 230 Volts/50 Hz. Note: If a product is designed to operate at a voltage/frequency combination in a specific market that is different from the voltage/frequency combination for that market (e.g., 230 Volts, 60 Hz in North America), the manufacturer should test the product at the regional combination that most closely matches the product's design capabilities and note this fact on the test reporting sheet. Further clarification regarding ENERGY STAR qualification in international markets is included in the ENERGY STAR Imaging Equipment specification.

Paper Specifications

For all TEC tests and for OM tests that require the use of paper, the paper size and basis weight shall be appropriate to the intended market, per the following table.

Paper Size and Weight

Market	Size	Basis Weight
North America:	8.5" x 11"	75 g/m^2
Europe/Australia/New Zealand/Taiwan:	A4	80 g/m^2
Japan:	A4	64 g/m^2

II. TEST EQUIPMENT

The goal of the test procedures is to accurately measure the TRUE power consumption[1] of the product. This necessitates the use of a **True RMS** power or energy meter. There are many such meters available, and manufacturers need to exercise care in selecting an appropriate model. The following factors must be considered when selecting a meter and conducting the test.

Frequency Response
Electronic equipment that contains switching power supplies introduces harmonics (odd harmonics typically up to the 21st). If these harmonics are not accounted for in power measurement, the result will be inaccurate. EPA recommends that manufacturers use meters that have a frequency response of at least 3 kHz; this will account for harmonics up to the 50th, and is recommended by IEC 555.

Resolution
For direct power measurements, resolution of metering equipment shall be consistent with the following requirements of IEC 62301:

"The power measurement instrument shall have a resolution of:

- 0.01 W or better for power measurements of 10 W or less.
- 0.1 W or better for power measurements of greater than 10 W up to 100 W
- 1 W or better for power measurements of greater than 100 W."[2]

In addition, the measurement instrument shall have a resolution of 10 W or better for power measurements greater than 1.5 kW. Measurements of accumulated energy should have resolutions which are generally consistent with these values when converted to average power. For accumulated energy measurements, the figure of merit for determining required accuracy is the maximum power value during the measurement period, not the average, since it is the maximum that determines the metering equipment and setup.

Accuracy
Measurements made with these procedures shall in all cases have an accuracy of 5% or better, though manufacturers will usually achieve better than this. With knowledge of the power levels of current imaging products and the meters available, manufacturers can calculate the maximum error based on the reading and the range utilized for the reading.

Calibration
Meters must have been calibrated within the last 12 months to ensure accuracy.

[1] True power is defined as (volts)x(amps)x(power factor), and is typically reported as Watts. Apparent Power is defined as (volts)x(amps) and is usually expressed in terms of VA or volt-amps. The power factor for equipment with switching power supplies is always less than 1.0, so true power is always less than apparent power. Accumulated energy measurements sums power measurements over a period of time and so also need to be based on measurements of true power.
[2] International Electrotechnical Commission, IEC 62301-2005, Measurement of Standby Power.